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(54) Pacemaker

(57) An implantable dual-chamber pacemaker programmed to operate primarily in an atrial tracking mode includes an atrial rate smoothing filter for producing a filtered atrial rate (FAR) from an intrinsic atrial rate. The pacemaker automatically switches its mode of operation from an atrial tracking mode (i.e., DDD, DDDR, VDD, VDDR, DDT or DDTR) to a non-atrial tracking mode (i.e., DDI, DDIR, VDI, VDIR, DDT or DDTR), in the event the filtered atrial rate exceeds a prescribed upper rate limit. Synchronously with this mode switch, the pacemaker automatically shortens a post ventricular atrial refractory period (PVARP) to a minimum, predefined or programmable value. In one embodiment, the shortened PVARP is set equal to a post ventricular atrial blanking period (PVAB) that ranges between approximately 50 msec and 200 msec. While in the alternate mode of operation, the pacemaker maintains the shortened PVARB refractory

period, and continues to monitor the FAR. As soon as FAR drops to a preset value or below, the pacemaker automatically switches back to its primary atrial tracking mode.

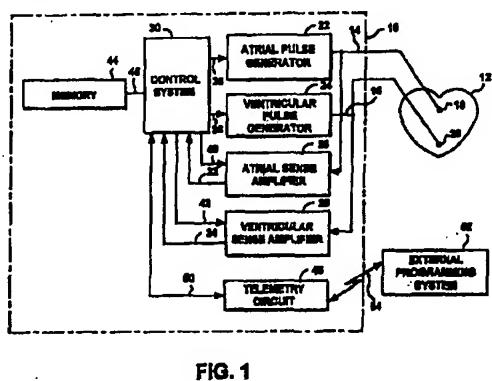


FIG. 1

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## EUROPEAN SEARCH REPORT

Application Number  
EP 00 30 2330

DOCUMENTS CONSIDERED TO BE RELEVANT			
Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.)
X	US 5 609 610 A (NAPPHOLZ TIBOR) 11 March 1997 (1997-03-11) * column 1, line 8 - column 2, line 63; figures *	1,2,19, 20	A61N1/368
A	— —	9,10,27, 28	
X	EP 0 526 798 A (SIEMENS ELEMA AB ;SIEMENS AG (DE)) 10 February 1993 (1993-02-10) * the whole document *	1,2,19, 20	
A,D	US 5 549 649 A (FLORIO JOSEPH J ET AL) 27 August 1996 (1996-08-27) * the whole document *	11,29	
A,D	US 4 944 298 A (SHOLDER JASON A) 31 July 1990 (1990-07-31) * the whole document *	1,19	
TECHNICAL FIELDS SEARCHED (Int.Cl.)			
A61N			
The present search report has been drawn up for all claims			
Place of search	Date of completion of the search	Examiner	
THE HAGUE	31 January 2001	Ferrigno, A	
CATEGORY OF CITED DOCUMENTS			
X : particularly relevant if taken alone Y : particularly relevant if combined with another document of the same category A : technological background D : non-written disclosure P : intermediate document			
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ON EUROPEAN PATENT APPLICATION NO.

EP 00 30 2330

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31-01-2001

Patent document cited in search report		Publication date	Patent family member(s)		Publication date
US 5609610	A	11-03-1997	NONE		
EP 0526798	A	10-02-1993	US 5269299 A	14-12-1993	
			AU 658639 B	27-04-1995	
			AU 1855892 A	11-02-1993	
			DE 69219692 D	19-06-1997	
			DE 69219692 T	11-09-1997	
			JP 5192416 A	03-08-1993	
			US 5301669 A	12-04-1994	
			US 5342405 A	30-08-1994	
US 5549649	A	27-08-1996	NONE		
US 4944298	A	31-07-1990	AU 616374 B	24-10-1991	
			AU 5677790 A	18-12-1990	
			DE 69031823 D	29-01-1998	
			DE 69031823 T	16-07-1998	
			EP 0426828 A	15-05-1991	
			JP 4501971 T	09-04-1992	
			WO 9014126 A	29-11-1990	

EPO FORM P0489  
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